A Review on Ethnopharmacology of *Verbascum chinense* (Scrophulariaceae)

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Abstract

**Background:** This review comprises morphology, phytoconstituents and ethnopharmacological aspects of *Verbascum chinense*. A few species of this genus have medicinal value, among these *Verbascum chinense* is traditionally used as a sedative, astringent, febrifuge, and for skin eruptions. The plant is also used in treatment of diarrhoea and dysentery, cuts, wound healing, jaundice, skin disorders, as an anti-inflammatory, anticancer. The aim of present review is to highlight the beneficial effects of the species of this genus have medicinal value, among these need to be investigated systematically so that potential species can be exploited as therapeutic agents.

**Method:** This is a review article, which was obtained by a search in databases such as Pub Med and Google Scholar.

**Result:** *Verbascum* species contain biologically active compounds, such as flavonoids, phenylethanoid and neolignan glycosides, saponins, iridoid and monoterpen glycosides. This review emphasizes the traditional uses of *Verbascum chinense*.

**Conclusion:** The review is intended to attract the attention of natural product researchers to focus on the unexplored potential of *Verbascum chinense*. This genus needs to be investigated systematically so that potential species can be exploited as therapeutic agents.

**Keyword(s):** *Verbascum chinense*, morphology, phytoconstituents, jaundice, skin disorders, anti-inflammatory, anticancer, ethnopharmacology

**INTRODUCTION**

*The Verbascum* species are being used in many countries all over the world. There are about 360 species known of which 6 *Verbascum* species are found in India 1. *Verbascum* species contain a wide range of compounds, such as glycosides [2, 3, 4, 5] alkaloids and saponin [6, 7]. *Verbascum* belongs to the family Scrophulariaceae, is an erect, pubescent herb. The plant *Verbascum chinense* (*Celsia coromandeliana*) (Scrophulariaceae) is commonly known as “Gidar Tambaku”. It is annual, sparsely pubescent simple or branched herb with a height of about 30-90 cm [8].

**Synonyms:**

Hindi : Kulahal, Gadar or Gidar tambakhu
Sanskrit : Kulahal, Sundika, Bhoottkeshi
Marathi : Kolhal, Kutki
Gujrati : Kalhar, Kulhar
Latin : *Celsia coromandeliana*
Botanical name: *Verbascum chinense*
Family : Scrophulariaceae

**Habitat and distribution**

It is distributed in India from Punjab ascending to 5000 feet in altitude, Afghanistan, Cambodia, China, Laos, Myanmar, Pakistan, Sri Lanka and Thailand. In Bangladesh, this species is found in Chittagong and Dhaka. It is found along roadsides, waste places near Nainital, Kotdwara, Satpuli, Srinagar and throughout Himalayan region up to 1200 m. It appears as weed, in the garden or cultivated land during the dry season [9, 10].

**Plant description**

Stems are annuals or biennials. They are 50–100 cm, branched apically and are sparsely glandular pilose. Petiole of stem leaves is 3–8 mm in length; leaf blade is pandurate and approximately 5–8 cm in length; there are 3–5 lobes, the terminal lobe is either ovate, elliptic, or oblong, margin is serrate distally, usually double serrate or proximally lobed. The leaves of a stem are short petiolate or sessile and leaf blade is ovate, elliptic, or ovate-triangular. The inflorescence is raceme either simple or branched. Rachises, bracts, pedicels, and calyces are glandular pilose. Flowers are solitary at each node. The pedicle is 5 mm, elongated to 1 cm in fruit. Calyx is 3–4.5 mm in length; lobes are elliptic-oblong. Corolla is yellow. There are 4 stamens, filaments are wooly and anthers are reniform. Flowers and fruits occur during March-August. [10]

**Pharmacological activities of *Verbascum chinense***

**Antibacterial Activity**

Kaur et al studied the antibacterial activity and phytochemical analysis of various extracts of *Verbascum chinense*. The antibacterial activity of various extracts of *V. chinense* was determined with agar-well diffusion method. The results provide evidence that the extracts of *V. chinense* contained glycosides, flavonoids, saponins and phenolic compounds which may be responsible for the substantial antibacterial activity. Among different solvent extract, chloroform and n-butanol extracts exhibited a broad spectrum of antimicrobial activity. It showed strong antibacterial activity against Gram-positive bacteria strain like *Klebsiella pneumoniae*, *Bacillus subtilis* and Gram-negative strains like *Escherichia coli*. The ethanolic and ethyl acetate extract showed low antibacterial activity against the bacterial strains [28].
Table 1: Ethnomedicality of Verbascum chinense

<table>
<thead>
<tr>
<th>Part used</th>
<th>Medicinal uses</th>
<th>Location</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roots</td>
<td>Goiter</td>
<td>Bangladesh</td>
<td>Mohammed Rahmatullah 2010 [12]</td>
</tr>
<tr>
<td>Juice of leaves</td>
<td>Sedative</td>
<td>India</td>
<td>Umberto Quattrocchi ,2012 [13]</td>
</tr>
<tr>
<td>Juice of leaves</td>
<td>Diarrhea</td>
<td>India</td>
<td>Alka Gupta 2014 [14]</td>
</tr>
<tr>
<td>Juice of leaves</td>
<td>Astringent</td>
<td>India</td>
<td>Kirtikar, K. R, 2010 [15]</td>
</tr>
<tr>
<td>Juice of leaves</td>
<td>Inflammation</td>
<td>India</td>
<td>Kataria Sandeep, 2001 [16]</td>
</tr>
<tr>
<td>Juice of leaves</td>
<td>Febrifuge</td>
<td>India</td>
<td>Umberto Quattrocchi ,2012 [13]</td>
</tr>
<tr>
<td>Powder of leaves and seeds</td>
<td>Piles</td>
<td>Maharashtra, India</td>
<td>Kamble S Y, 2010 [17]</td>
</tr>
<tr>
<td>Leaves</td>
<td>Skin Disorders, Cuts</td>
<td>Uttarakhand India</td>
<td>Jyotsana Sharma, 2013 [18]</td>
</tr>
<tr>
<td>Infusion of leaves</td>
<td>Gout</td>
<td>Aurangabad district (M. S.)</td>
<td>Mali PY and Bhadane VV (2011)[20]</td>
</tr>
<tr>
<td>Leaf poultice</td>
<td>Reduce Swelling Of Joints</td>
<td>Aurangabad district (M. S.)</td>
<td>Mali PY and Bhadane VV (2011}[20]</td>
</tr>
<tr>
<td>Decoction of plant</td>
<td>Helminthic Infections, Skin</td>
<td>Bhola district, Bangladesh</td>
<td>Ahmed Abrar Muttaki 2014 [24]</td>
</tr>
<tr>
<td>Bark</td>
<td>Disease, Decrease Inflammation Of Hands And Feet</td>
<td>South Western Maharashtra, India</td>
<td>T. Pullaiah [25]</td>
</tr>
<tr>
<td>Root</td>
<td>Menorrhoea</td>
<td>South Western Maharstra, India</td>
<td>T. Pullaiah [25]</td>
</tr>
<tr>
<td>Juice of leaves</td>
<td>Acute And Chronic Dysentery,</td>
<td>South Western Maharstra, India</td>
<td>T. Pullaiah [25]</td>
</tr>
<tr>
<td>Juice of whole plant</td>
<td>Astringent, Sedative</td>
<td>India</td>
<td>T. Pullaiah [25]</td>
</tr>
<tr>
<td>Juice of leaves, roots stem</td>
<td>Bleeding Piles, Emetic,</td>
<td>India</td>
<td>T. Pullaiah [25]</td>
</tr>
<tr>
<td>Roots</td>
<td>Dysentery, Cholagogue</td>
<td>India</td>
<td>George Watt C .2012 [26]</td>
</tr>
<tr>
<td>Crushed leaves and plant</td>
<td>Fish Poison</td>
<td>India</td>
<td>Rajendran A, 1997 [27]</td>
</tr>
</tbody>
</table>

**Antifungal activity**

Effect of extract of 18 plant species, viz., *Acorus calamus*, *Adhatoda vasica*, *Amomum subulatum*, *Andrographis paniculata*, *Boerhaavia diffusa*, *Cassia occidentalis*, *Centella asiatica*, *Cymbopogon citratus*, *Hemidesmus indicus*, *Hypitisi suaveolens*, *Malvesium sp.*, *Passiflora edulis*, *Pergularia daemia*, *Peristrophe bicafculata*, *Shuteria hirsuta*, *Solananum nigrum*, *Tecoma stans*, and *Verbascum chinense* on the growth of *Microsporum gypseum*, *Chrysosporium tropicrum* and *Trichophyton terrestre* was evaluated and discussed. The sensitivity of the keratinophilic fungi was evaluated and discussed. **References** [29].

**CNS activities**

The methanol extract of aerial part of *V. chinense* was reported to cause significant depression in general as well as exploratory behavioral profiles in mice. The petroleum ether extract of aerial parts of *V. chinense* had significant analgesic properties and protection against strychnine- and lepta zol-induced convulsions in rats [31].

**Anthelmintic activity**

The anthelmintic activities of different extracts of aerial parts of *V. chinense* were evaluated on adult Indian earthworm (*Pheritima posthuma*). Petroleum ether (PECC), chloroform (CCC), ethanol (ECC) extracts of *V. chinense* showed anthelmintic activities and were comparable with that of the effects produced by the reference standards albenzadole (10 mg/ml) and piperazine citrate (10 mg/ml) [32].

**Antioxidant activity**

*Verbascum chinense* possess activity against Walker 256, sarcoma 180 and human epidermoid carcinoma of nasopharynx; cell culture. An anticancer compound Celsioside C was isolated. The plant phytoconstituents celioides II and III exhibited anticancer activity [30].
The in vitro antioxidant activity of aerial parts of \textit{V. chinense} had been investigated by estimating the degree of non-enzymatic hemoglobin glycosylation. It was found that chloroform extract of \textit{V. chinense} had the highest antioxidant activity and comparable to that of standard antioxidant compounds D-\(\alpha\)-tocopherol (vitamin E) and ascorbic acid (vitamin C) [33].

**Antifertility effect**

Petroleum ether extract of aerial parts of \textit{C. coromandelina} (\textit{V. chinense}) (PECC) and a fractionate stigmasterol derivative was tested for the onset of reproductive maturity and the ovarian steroidogenesis in immature female mice. Total cholesterol and ascorbic acid content in ovaries and carbonic anhydrase activity in uterus were increased significantly (low dose by 49.3, 424.6 and 82.4\%, respectively) along with a reduction in the weight of ovary, uterus and pituitary in comparison to that of control [33].

Ontogeny, structure, and differentiation of anther tapetum was studied in \textit{Celsia coromandeliana} (\textit{V. chinense}) [34].

**Phytochemical studies of \textit{Verbascum chinense}**

\textit{Verbascum chinense} is reported to contain celsianol a mixture of 6-dihydrostigmasterol and \(\alpha\)-spinasterol, saponins and celsiosides I, II, III. Other constituents are \(\beta\)-sitosterol-\(\beta\)-D-glucoside. New sterol sigmasta - 5, 9 (11) - dien- 3\(\beta\) - ol, three new saponins: celsiogenin a [olean - 12, 17 (18) - dien - 3\(\beta\), 23 - diol], celsiogenin B [olean - 11, 13 (18) - dien - 3\(\beta\), 23, 28 - triol ], celsiogenin C [olean - 11, 13 (18) - dien - 3\(\beta\), 22\(\beta\), 23, 28 -tetril ]. The seed oil was found to contain 22.0\% 9-hydroxyoctadec-cis-12-enoic acid (isoricinoleic acid) previously unknown in the scrophulariaceae family. It also consists of other normal fatty acids such as lauric acid (1.3\%), myristic acid (2.6\%), palmitic acid (8.2\%), stearic acid (3.2\%), oleic acid (17.2\%), and linoleic acid (45.5\%) [35,36,37,38]. Along with these chemical constituents some iridoid glycosides such as aucubin, catalpol, 6-xyllosylaucubin and 6-xyllosylcatalpol 6-(4’-p-coumaroyl)- xyllosylaucubin (named phlomoid) and iridoid ester glycoside, specioside, occur in \textit{V. phlomoides}, \textit{V. densiflorum}, flowers [39]. In \textit{V. densiflorum} flower, apigenin and luteolin and their 7-glucosides, quercetin 7-glucoside, 3, 7-diglucoside, tamarixetin 7-rutinoside and diosmin (diosmetin 7-rutinoside) have been reported whereas glycosides of luteolin and quercetin are predominant in the flower of \textit{V. thapsus} [40]. In \textit{V. phlomoides} flowers contain tamarixetin 7-rutinoside (predominant), tamarixetin 7-glucoside, apigenin and luteolin and their 7-glucosides, diosmin, chrysoeriol, eriodictyol, kaempferol, quercetin and rutin [41]. Phenylethanoid glycosides such as verbascoside (acteoside), forsythoside B (verbascoside 6’-apioside) were present in \textit{V. densiflorum} flower [42]. Phenolic acids such as vanillic, p-hydroxybenzoic; p-coumaric, ferulic, protocatechuic and p-hydroxycinnamic acids have been identified in the flowers of \textit{V. densiflorum} and \textit{V. phlomoides}. Also p-coumaric acid glucoside has been found in \textit{V. phlomoides} flowers [43, 44].
CONCLUSION
The present review reveals that the plant is used in the treatment of various disorders. Keeping in view the phytochemical and ethnopharmacological reports, the frequency of use, *Verbascum chinense* seems to hold great potential for in-depth investigation of various biological activities. Few preliminary ethnopharmacological reports support the medicinal potential of *Verbascum chinense*. This need to be investigated systematically with a view to establishing their varied pharmacological activities and mode of actions.

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